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NOTES ON THE BREEDING HABITS OF THE SWAMP CRICKET FROG, CHOROPHILUS TRISERIATUS Wied.

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ABOUT nineteen years ago, Professor O. F. Hay[1] while searching the ponds about Irvington, Indiana, for Ambystomas and their eggs discovered the eggs of *Chorophilus triseriatus.* The eggs were well advanced in development and his observations on the succeeding stages constitute most of what we know of the life-history of the swamp cricket frog.

While on a similar search for *Ambystoma jeffersonianum* in the suburbs of Buffalo one of us found several males and females of Chorophilus and, subsequently, some anuran eggs which for a time remained unidentified. Inasmuch as the identification of these eggs furnished data upon the mating, egg-laying process and fresh eggs of *Chorophilus triseriatus*—the period preceding that of which Professor Hay's observations treat—it seems advisable to present this material.

During the last weeks of March Chorophilus appears in considerable numbers about the outskirts of Buffalo. The male chorus which is easily distinguished from that of *Hyla pickeringii* rises from most of the swamps and temporary ponds, even within the city. The singers themselves, however, are not easily seen, for, upon approach, they become silent and further disturbance causes them to disappear into the vegetation at the bottom of the pond where they remain until some time after the disturbance has ceased. Then, from the most remote corner the chorus is gradually taken up until the whole pond resounds with the ringing notes. In taking up the chorus, the assurance evidenced by the single voice is extremely contagious. This fact makes it possible to overcome some of the difficulties which ordinarily present themselves in collecting this species. One has but to place the first captures in a bag or other close receptacle and carry it on one's person. The prisoners chirp up and sing as boldly as though undisturbed in their natural haunt. Their voices elicit an almost immediate response from those in the pond. Indeed, at such a time, with a little practise one can wade about, while they sing on all sides and dip up as many as one desires.

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[1] Hay, O. P. Notes on the Life History of *Chorophilus triseriatus.* AM. NAT., 23 September, 1899, No. 273, p. 770.

In this way after spending several hours in capturing the first two, 30 specimens, 25 males and 5 females, were taken in less than an hour. These were isolated for the purpose of studying the egg-laying process. On the way from Buffalo to Ithaca (April 1, 1907), they were kept in the same box, but the sexes in separate compartments. During the transit, the males chirped considerably and the females deposited 200 or 300 eggs without attendant males.

The Embrace.—The usual Hyla type of embrace obtains, the forearms of the male being pressed into the axillæ of the female. The males at the height of the breeding period evince an ardor almost as eager as that of the common toad. Sometimes, they embrace each other and as many as 4 or 5 males have been found in one bunch.

A peculiar embrace recorded June 16, 1907, may serve to illustrate how long this nuptial impulse may remain with the male. April 1, 1907, about 30 *Hyla pickeringii*, 1 female, 29 males, and 5 male *Chorophilus triseriatus* were placed in one jar. Between April 1 and June 16, these swamp cricket frogs ate nothing, yet, after 2½ months, and, evidently long past the breeding time, an emaciated male *Chorophilus triseriatus* mated with the single female *Hyla pickeringii*. The embrace was axillary, but sometimes, possibly due to weakened condition, the male partially lost his hold. Then, his arms slipped along on the sides of the body of the female until he came to the lumbar embrace, the arms touching each other on the ventral side. The male disliking this embrace sought to move along the body of the female to the customary amplexation of his species. A similar weakened condition may explain the occasional records of lumbar embraces with other captive anurans which normally adhere to the axillary type.

At the height of the breeding season the male Chorophilus, like other Anura, often grasp moving objects or animals which are in the same aquarium with them.

The Egg-laying.—On the morning of April 2, 1907, the 25 male *Chorophilus triseriatus* were placed with the five females. At 9:50 A. M., the first mated pair was recorded and, within 20 minutes the female began laying. With one exception, she chose a different perch for each egg-laying period, thus giving a bunch to each period of sexual activity. In one instance she sought the same perch 3 successive times. She ordinarily grasped the branch with her forelimbs. When about to deposit she brought one heel up to the stem and near the vent. Farther back the other foot held the stem with the toes. Each time, just before the voidance of eggs the female raised her anus and the male stretched to bring his vent near that of the female.

This pair consumed 2½ hours in laying a complement of 500 or 600 eggs. The process required about 90 fertilizations and emissions. The intervals between a simultaneous fertilization and emission and a similar succeeding period ranged from 16–35 seconds, the common range 17–30 seconds, the modal time, 20 seconds, the average, 21 seconds. Each time, from 2–10 eggs were voided, being emitted in small strings, a condition which could be most readily seen when occasionally the eggs were unattached to the stem and hung down from the vent of the female. In such cases the strings broke after 10–12 eggs were voided. There were 16 periods of egg-laying, 20–70 eggs being usually laid at a period and each period consumed from 2–7 minutes, 3 minutes being the modal time. Always after a period of laying the pair arose to the surface of the water. These 15 periods of rest varied from 2–17 minutes, the mode being 4 minutes. All the eggs were laid in water 66° F.

An account of the first pair follows in tabular form:

Number of Sexual Periods.	Length of Sexual Activity.	Intervals Between Periods of Sexual Activity.	Number of Eggs.	Fertilizations and Emissions.	Intervals between Each Emission.
1	3 min	17 min.		8	
2	7 “	4½ “		7	
3	3½ “	5 ‘	2–7	8	
4	3 “	11 “		9	20, 25, 20, 17, 22, 17, 20, 21 secs.
5	5 “	2 “		14	20, 18, 17, 20, 22, 20, 20, 20 “
6	2 “	2 “		4	18, 20, 18 “
7	3 “	4 “		7	35, 17, 20, 25, 23, 18 “
8	3 “	3 “		6	22, 23, 25, 20, 18 “
9	2 “	16 “		7	20, 20, 22, 17, 17, 17 “
10	4 “	3 “		9	28, 27, 27, 22, 22, 20, 23, 17 “
11	4 “	4 “	2, 2, 3, 3, 7, 4	6	
12	2½ “	10 “		7	
13		6 “	3	1	
14		5 “	2	1	
15		15 ‘	2	1	
16	1½ “		2, 8, 4	3	

The Eggs.—The second pair were in the embrace at noon. At 1:30 P. M. they began laying and by 4:30 P. M. their complement numbering 600 eggs was laid. The complements of females of *Chorophilus triseriatus* vary from 500–800 eggs. The mature eggs of one ripe female, 3.2 cm. long, numbered 418 for the right ovary, 354 for the left, or a total of 772.

The eggs are laid in bunches and are attached to twigs, branches, fine roots or grass stems. Each bunch contains from 30–100 eggs. An actual count of 5 bunches gave 50, 80, 70, 68, 70, respectively.

The measurements of eggs gave the following results: the average vitellus diameter of 38 eggs was 1.1 mm., the mode, 1.2 mm., the range, .9–1.2 mm.; the average envelop diameter was 5.8 mm., the mode, 5.6 mm., the range usually 5.0–7.8 mm., though sometimes as low as 3.0 mm.

The vegetative pole is white; the animal, brown or black. The envelop about each individual egg makes up the larger portion of the jelly mass of a bunch, yet, there is in addition, some connecting jelly. This has a loose gelatinous consistency and does not envelop the whole mass as in Ambystoma.